Space Sci Rev (2018) 214:118
https://doi.org/10.1007/s11214-018-0549-7

Past, Present and Future of Active Radio Frequency Experiments in Space

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Received: 14 March 2018 / Accepted: 4 October 2018 / Published online: 30 October 2018

Abstract Active ionospheric experiments using high-power, high-frequency transmitters, "heaters", to study plasma processes in the ionosphere and magnetosphere continue to provide new insights into understanding plasma and geophysical proceses. This review describes the heating facilities, past and present, and discusses scientific results from these facilities and associated space missions. Phenomena that have been observed with these facilities are reviewed along with theoretical explanations that have been proposed or are commonly accepted. Gaps or uncertainties in understanding of heating-initiated phenomena are discussed together with proposed science questions to be addressed in the future. Suggestions for improvements and additions to existing facilities are presented including important satellite missions which are necessary to answer the outstanding questions in this field.

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